

Oregon Wildfire Response Protocol for Severe Smoke Episodes

June 3, 2014

(version 2.0)

The following agencies collaborated on this guidance document:

Oregon Department of Environmental Quality

Lane Regional Air Pollution Authority

Oregon Health Authority

Oregon OSHA

Oregon Emergency Management

Oregon Department of Forestry

US Forest Service



Based on agreement between the participating agencies, the original version of this multi-agency document shall be maintained by DEQ. Future updates to this document shall be made in collaboration with all parties.

Revision History	Date	Revision Summary
version 1.0	May 28, 2013	Protocol developed
version 1.1	August 27, 2013	Agencies added, contact list updated
version 2.0	June 3, 2014	Revised Table 4 recommended health actions, changed Visibility Index to the 5-3-1 Visibility Index, added Wildfire Communications Plan section, added Indoor Air Monitoring section, added 211info Service information, updated contact list, added out-of-state contact list

Alternative formats (Braille, large type) of this document can be made available. Contact DEQ's Office of Communications & Outreach, Portland, at (503) 229-5696, or toll-free in Oregon at 1-800-452-4011, ext. 5696.

Table of Contents

1. Purpose.....	1
2. Participating Agencies and Organizations	1
Table 1	1
3. Agency areas of expertise and involvement	2
Table 2	2
4. Agency actions and desired outcome	4
Table 3	4
5. Recommended Public Health Actions, based on level and anticipated duration of smoke exposure	5
Table 4	6
Using the Visibility 5-3-1 Index	8
Table 5	9
6. Oregon Smoke Blog website	9
7. Annual Pre-Wildfire Season conference call	9
8. As-Needed Wildfire conference calls and briefings.....	9
9. Oregon Wildfire Communications Group	10
10. Indoor Air Monitoring Equipment	10
11. Other references, resources, and links.....	11
Wildfire Smoke: A Guide for Public Officials (2008).	11
Wildfire-related websites.	11
Oregon Webcams.	11
Map of High Wildfire Risk Areas in Oregon.	12
Oregon Health Authority - health effects from wildfire smoke.	12
12. Appendices	12
Current Agency Contact List.	12
Examples of Wildfire Smoke Public Announcements.	12
Appendix A.....	13
Oregon Contact List	13
Out-of-State Contact List	15
Appendix B.....	16
Example 1 of Wildfire Smoke Public Announcement.....	16
Example 2 of Wildfire Smoke Public Announcement.....	17

1. Purpose

This protocol is intended to provide guidance for the state and federal agencies in Oregon who respond to severe smoke episodes caused by large or long duration wildfires, to ensure a coordinated response, in order to mitigate impacts on public health. This protocol also identifies other organizations, partners, and other governmental entities (county, city, and tribal) that state and federal responders need to coordinate with during these episodes. For all parties, it highlights general duties and responsibilities, provides examples of agency actions and assistance needed, desired outcomes, and recommended public health actions based on the level and duration of smoke exposure. This protocol is focused specifically on air quality impacts, as compared to the safety risk posed by the fire itself. It should be noted, this protocol is intended to guide the use of resources in response to air quality due to major wildfires. It does not replace, interfere with, or limit any action taken by a public agency in the course of performing its official duties.

2. Participating Agencies and Organizations

This protocol is used by, but is not limited to the following agencies, organizations and offices:

Table 1

AGENCY OR ORGANIZATION	
Federal	
1. Federal Land Managers (FLM): Includes U.S. Forest Service and Bureau of Land Management (BLM)	USFS Region 6 office in Portland BLM, Oregon State Office in Portland
2. Federal Emergency Management Agency (FEMA)	Region 10 office Bothell WA
3. Environmental Protection Agency (EPA)	Region 10 office in Seattle WA
National	
4. Air Resource Advisor (ARA)	TBD (to be assigned to major Oregon WFs)
5. Red Cross	5 regional offices in Oregon
State	
6. Oregon Dept of Environmental Quality (DEQ)	DEQ Headquarters in Portland and DEQ regional offices
7. Oregon Health Authority (OHA)	Public Health Division located in Portland
8. Oregon Military Department, Office of Emergency Management (OEM)	Agency located in Salem
9. Oregon Occupational Safety and Health Administration (OR-OSHA)	OR-OSHA Headquarters located in Salem, field offices around the state.
10. Oregon Dept of Forestry (ODF)	Agency located in Salem
11. State Fire Marshal	Agency located in Salem
12. Oregon Governor Office	Located in Salem
13. Governor's Office Regional Solutions Centers	Located in different regions of the state
14. 211info	Located in counties
Local	
15. County Health Department	In county affected by WF smoke. See Appendix A for contact information.

16. Lane Regional Air Protection Agency (LRAPA)	Lane County agency located in Springfield
17. School Districts	In county affected by WF smoke
18. City and local government	Affected by WF smoke
Tribal	
19. Tribal Government	Any tribal lands affected by WF smoke. See Appendix A for contact information.

3. Agency areas of expertise and involvement

Table 2 identifies the general areas of expertise of each agency or organization, as an indication of the assistance that would be provided, and the level of involvement anticipated. While the level of involvement is relative to the severity of the wildfire smoke and the resultant effect on air Quality (AQ), some agencies would be expected to play more of a lead role, requiring more frequent daily communication and coordination, while other agencies would have a lesser role and would be involved on more of an as-needed basis.

Table 2

CONTACT AGENCY OR ORGANIZATION	General area of expertise/assistance	Anticipated level of involvement
Federal		
1. Federal Land Managers (US Forest Service & BLM)	Wildfire suppression/containment, ensure incident management team is on the ground; provide wildfire status updates, and public outreach/coordination.	Extensive – depends on size of WF, often the lead agency.
2. FEMA	Federal response agency for natural disasters	Low, unless smoke levels and fire danger pose an extreme threat
3. EPA Region 10	Coordination with tribes, related to air quality on tribal lands/reservations	Depends on the extent wildfire smoke is impacting tribal lands/reservations.
National		
4. Air Resource Advisor (ARA) – reports to Incident Command and/or Agency Administrator	Technical Specialist that works with Incident Command Team during major WFs. Expertise in AQ monitoring and modeling, and addressing public health, transportation safety, firefighter safety.	Extensive – newly created position to provide assistance to incidents, and facilitate state response to air quality smoke impacts from major wildfires.
5. Red Cross	Providing aid and assistance for natural disasters. Mass Care support for sheltering, feeding, and distributing relief supplies.	Depends on severity of smoke impact and risk to public health.
6. 211info	Providing a statewide “go-to public phone number” for health information about wildfire smoke impacts.	Depends on severity of smoke impact and risk to public health.
State		
7. Oregon Dept. of Environmental Quality	Monitoring AQ in the state*, determining if health standards are being exceeded, identifying areas at	Extensive during periods of elevated smoke levels.

(For WF smoke affecting Lane Co, contact LRAPA . See #16 above and Appendix A #10)	greatest risk, public/media outreach and coordination with FLMs, OHA, county health departments, others as needed. (*except Lane Co. see LRAPA)	
8. Oregon Health Authority	Advising state, federal, and local authorities on health risk from smoke and potential public health interventions to mitigate it. Assisting DEQ, OR-OSHA, and local health departments in communication and outreach. Access health impacts as indicated by the situation.	Depends on severity and extent to which local health officials need assistance, or where no local health authority is in place.
9. Oregon Military Department, Office of Emergency Management	Coordinating and facilitating emergency planning, with state emergency support function, and local emergency services agencies and organizations.	Depends on severity and specific requests by local emergency management agencies for state assets. High involvement if Governor declares state of emergency.
10. Oregon OSHA	Address worker health and safety in the workplace, and state/private firefighters in the field, through enforcement and/or consultation. Can assist in the evaluation of air quality concerns.	Depends on severity and specific requests for worker protection.
11. Oregon Dept. of Forestry	Upon request, provide wildfire smoke forecasts where needed. (If fire on state forest lands, ODF is lead response agency, similar to #1 above.)	Primarily providing daily smoke forecasts.
12. State Fire Marshal	Assist in response to fire danger, coordinate with local fire officials.	Primary response to fire danger and suppression, less on smoke risk
13. Oregon Governors' Office	Coordinate with multiple agencies, especially if Governor declares a state of emergency.	Update on as-needed basis, unless state of emergency is declared.
14. Governor's Office Regional Solution Centers	Coordinate with multiple agencies, especially if Governor declares a state of emergency.	Update on as-needed basis, unless state of emergency is declared.
Local		
15. County Health Department	Notify public and media of health risk from smoke. Coordinate with DEQ, OHA, FLMs and OR-OSHA.	Extensive during periods of unhealthy to hazardous smoke levels.
16. School Districts	With assistance, determine if student health at risk, need to cancel school events or announce school closures.	On as-needed basis during periods of unhealthy to hazardous smoke levels.
17. City and local government	With assistance, determine health risk to community, public safety, need to cancel outdoor events, notify local businesses, alert fire and police.	On as-needed basis during periods of unhealthy to hazardous smoke levels.
Tribal		
18. Tribal Government	Coordination with above agencies. Similar role to #7 and #17 above.	Can be high if WF impact is severe.

4. Agency actions and desired outcome

Table 3 describes the different actions and assistance needed during major wildfire events, the agency or organization expected to take such action, and the desired outcome.

Table 3

ACTION NEEDED	Lead agency and action taken	Desired Outcome
1. Air Monitoring		
Measuring ambient AQ	Mostly DEQ as lead agency. ARAs may be able to provide additional monitoring equipment via national cache resources and assist in deployment and data collection.	Ability to track ambient AQ levels in communities receiving the heaviest impact, and identify smoke-free areas where AQ is good.
Indoor AQ exposure	OR-OSHA is lead agency to evaluate air quality concerns for workers. DEQ and OHA can provide advice to schools upon request.	Ability to monitor indoor smoke levels in work environments and schools.
2. Smoke Forecasting and Modeling		
Smoke weather forecast	ODF as lead agency. DEQ assist in coordination. National Weather Service can be contacted to provide “spot weather forecasts” for wildfire, if needed.	Provide advance notice of possible smoke movement and impacts, improve public notification, lower risk of public exposure to high smoke levels.
Smoke modeling	ARA can provide smoke modeling forecasts if requested.	Complementary to above.
3. Issuing Health Warnings		
Providing public with frequent smoke updates on potential health risk, and recommended public health actions via the web and media.	Coordination between DEQ, ARA, OHA, county health dept, local government, tribes, and 211info. Assistance from FLM on fire status, and from ODF wildfire forecasting.	Frequent coordinated updates provided to the public via Oregon Smoke Blog, DEQ, OHA, local government websites, press releases and outreach to TV and print media. 211info is provided with up-to-date health-related information.
4. Website management		
Updating the Oregon Smoke Blog website (see description under #6)	Blog website initiated by FLM or DEQ, and updated by a website management team of representatives from participating agencies.	Provide the public with comprehensive “one-stop” website on wildfire status, AQ levels, health risk, public shelters, press releases, and other critical info.
Updating DEQ, OHA, and local websites	Managed by respective agency. Supplements the Oregon Smoke Blog website.	Complements the above website.
5. Public Actions		
Cancel or modify public events, outdoor and business activities.	Decision made at the local level, by government, tribal, or school authorities, in consultation with DEQ,	Prompt action taken, via notification of media, 211info, and posting info on Oregon Smoke Website and other

Consult with schools on limited hours or closure.	ARA, OHA, FLM, and possibly OSHA.	relevant websites.
Set up public shelters, assist schools or other public buildings in protecting from smoke	Red Cross can provide support in sheltering operations, based on decisions by local health officials. Decisions about protecting schools and public buildings made at the local level, in consultation with DEQ, ARA, OHA, and possibly OR-OSHA.	When determined necessary, prompt action taken to set up clean air shelters, or identify measures for protecting schools and public buildings from smoke.
Recommended evacuation/relocation of sensitive populations	Decision made by local level, by health officials and tribal/local government, in consultation with DEQ, ARA, OHA, FLM, Red Cross, and possibly OR-OSHA.	Prompt action taken if dangerous smoke levels expected to persist for a prolonged period. Requires close communication with DEQ, OHA, FLM, OR-OSHA, 211info, and possibly OEM, Red Cross, SFM, and State Police.

5. Recommended Public Health Actions, based on level and anticipated duration of smoke exposure

Wildfire smoke is a mixture of gases and fine particles which can irritate eyes and respiratory systems, and worsen chronic heart and lung diseases. The quantity and duration of smoke exposure, as well as a person's age and degree of susceptibility, play a role in determining whether or not someone will experience smoke-related health problems. Persons with pre-existing health conditions such as asthma or other chronic respiratory conditions and cardiovascular disease, or people ≥ 65 years of age, infants and children, pregnant woman and smokers are particularly sensitive to smoke.

Particulate matter (PM) in smoke poses the greatest risk to public health. The potential health effects vary depending on the size of the particles. Particles larger than 10 micrometers usually irritate only the eyes, nose, and throat. Particles smaller than 2.5 micrometers ($PM_{2.5}$) can be inhaled deeply into the lungs, increasing the risk of cardiovascular and respiratory problems. When smoke levels are high, even healthy people may experience symptoms.

Table 4 is designed for use by affected local jurisdictions in consultation with DEQ, OHA and other agencies that are parties to this protocol. The table identifies recommended public health actions to be taken, based on the intensity and expected duration of smoke exposure. The AQI category and $PM_{2.5}$ levels are derived from the federal $PM_{2.5}$ health standard of $35 \mu g/m^3$ for a 24-hour average (the AQI category "unhealthy for sensitive groups"). Decisions about which public health actions to recommend would be based on monitoring data and the projected smoke duration. The duration of smoke exposure noted in the table uses 72 hours as the basis for two sets of recommended health actions. Those actions for less than 72 hours include shorter periods as well, such as 24 or 48 hour periods, as all represent a shorter exposure that pose a similar health risk. After 72 hours, health agencies will have more robust data and situational awareness that can inform more situation-specific actions, some examples of which are outlined in Table 4.

In the absence of any PM_{2.5} monitoring data, a visual evaluation can be made by using the visibility index (based on the viewing distance) in the column next to the AQI category. This index is referred to as the “5-3-1 Visibility Index” for estimating smoke levels, as is described on page 9 and Table 5 of the protocol. Both the AQI category and 5-3-1 Visibility Index are intended to be used together in identifying the public health risk and mitigation actions.

Whether or not the listed actions in Table 4 should actually be taken at various PM_{2.5} levels depends on additional factors in the bulleted list below the table. As air quality worsens, recommended public health actions for better air quality categories should also be implemented. For example, if the air quality is considered “unhealthy,” then actions should be followed for “unhealthy for sensitive groups,” “moderate” and “good” air quality days.

Table 4

AQI Category (24-hr average PM _{2.5} in µg/m ³)	5-3-1 Visibility Index ¹	Recommended Public Health Actions	
		Sensitive Populations or Exposure under <72 hours	Extended Smoke Exposure over 72 hours
Good (0-12 µg/m ³)	over 15 Miles	If smoke event is forecast in your area, review the Oregon Wildfire Response Protocol for Severe Smoke Episodes, Crisis and Emergency Risk Communication (CERC) Toolkit for Wildfires, Frequently Asked Questions about Wildfire Smoke and Public Health document, and more health tips on the Oregon Public Health Division webpage. ² The Oregon Smoke Blog has information about the latest air quality and other wildfire information: http://oregonsmoke.blogspot.com/ .	
Moderate (13-35 µg/m ³)	5-15 Miles	<ul style="list-style-type: none"> - Distribute information (i.e., FAQ) to public health partners and the public. - Focus on identifying and getting the information to vulnerable populations. - Refer people to the Oregon Smoke Blog for more information. 	<i>Follow recommended actions to the left and above, plus:</i> <ul style="list-style-type: none"> - Respond to media inquiries. (Use the CERC toolkit for guidance)
Unhealthy for Sensitive Groups (36-55 µg/m ³)	3-5 Miles	<i>Above, plus:</i> <ul style="list-style-type: none"> - Issue a press release, outlining sensitive groups and encouraging them to reduce exposure. (Use the CERC toolkit and FAQ document for guidance.) - If school is in session, refer to <i>Public Health Guidance for School Outdoor Activities during Wildfire Events</i>. 	<i>Follow recommended actions to the left and above, plus:</i> <ul style="list-style-type: none"> - In the release, include consideration of spending time in a clean air setting in the community (i.e., air conditioned library) or leaving the area until air quality improves. - Consider opening a clean air shelter for sensitive groups.

Unhealthy (56-150 µg/m ³)	1-3 Miles	<i>Above, plus:</i> <ul style="list-style-type: none"> - Consider cancelling outdoor public events. - Recommend public limit strenuous outdoor activities. - Recommend that sensitive groups shelter-in-place, spend time in a clean air setting in the community (i.e., air conditioned library) or consider leaving the area until air quality improves. 	<i>Follow recommended actions to the left and above, plus:</i> <ul style="list-style-type: none"> - Open and publicize clean air shelters for sensitive groups.
Very Unhealthy (151-250 µg/m ³)	1-3 Miles	<i>Above, plus:</i> <ul style="list-style-type: none"> - Cancel outdoor public events. - If school is in session, measure indoor air quality if possible, discuss school closure with school administrators. - Recommend shelter-in-place for general population. - Share info about periods of improved air quality to guide essential outdoor activity and ventilation of dwellings (refer to FAQ for more info). 	<i>Follow recommended actions to the left and above, plus:</i> <ul style="list-style-type: none"> - Open and publicize clean air shelters for sensitive groups.
Hazardous (>251 µg/m ³)	<1 Mile	<i>Above, plus:</i> <ul style="list-style-type: none"> - Recommend voluntary evacuation for sensitive groups. 	<i>Follow recommended actions to the left and above, plus:</i> <ul style="list-style-type: none"> - Open and publicize clean air shelters for the general public.

¹ For how to use the **5-3-1 Visibility Index**, see below. The visibility test is not appropriate or effective in areas with high humidity, such as in Western Oregon near or on the coast, where water vapor (fog) may limit visibility.

² Crisis and Emergency Risk Communication (CERC) Toolkit for Wildfires:

<http://public.health.oregon.gov/Preparedness/Partners/Pages/riskcommunicationtools.aspx>

Wildfire Smoke and Your Health, Frequently Asked Questions about Wildfire Smoke and Public Health:

<http://public.health.oregon.gov/Preparedness/Prepare/Documents/OHA%208626%20Wildfire%20FAQs-v6c.pdf>

Public Health Guidance for School Outdoor Activities during Wildfire Events:

http://public.health.oregon.gov/Preparedness/Prepare/Documents/2014Public_Health_Guidance_for_Outdoor_School_Activities.pdf

Oregon Public Health Division Wildfire webpage:

<http://public.health.oregon.gov/Preparedness/Prepare/Pages/PrepareForWildfire.aspx>

Considerations that may influence implementation of the above mitigating actions:

- Clear/predictable fluctuations in air quality throughout the day can allow for modifications in the recommendations from the above table. For example, schools could delay recess instead of canceling it if there is a pattern of clearing in the afternoon. For another example, if clean air shelters are provided, they should be open and available at the times of day that smoke is heaviest (i.e. may be at night).

- If smoke is predicted to be heavy for short durations (i.e., a few hours) the public health messaging should be to encourage people to avoid spending time outdoors.
- Indoor air quality may be poor in older dwellings. These may include schools, community centers with care centers, nursing homes, or group homes. When air quality is “Unhealthy” for an extended smoke duration, it may be worthwhile to assess indoor air quality for these and other types of facilities where people who are sensitive to smoke live or stay.

Using the Visibility 5-3-1 Index

Since wildfires often occur in remote areas, air monitoring equipment may not be available. Smoke levels can rise and fall rapidly, depending on weather factors including wind direction. Making visual observations using the 5-3-1 visibility index is a simple way of estimating smoke levels and what precautions to take, as noted in Table 4 recommended actions. While this method can be a useful tool, persons should always use caution and avoid going outside if visibility is limited, especially persons who may be sensitive to smoke.

The procedure for using this visibility index is as follows:

1. Determine the limit of your visual range by looking for distant targets or familiar landmarks such as mountains, mesas, hills, or buildings at known distances (miles). The visual range is that point at which these targets are no longer visible.
2. Ideally, the viewing of any distance targets should be made with the sun behind you. Looking into the sun or at an angle increases the ability of sunlight to reflect off of the smoke, and thus making the visibility estimate less reliable.
3. Once distance has been determined, follow this simple guide:
 - If over 15 miles, the air quality is generally good.
 - Between 5-15 miles, air quality is moderate and beginning to deteriorate, and is generally healthy, except possibly for smoke sensitive persons. The general public should avoid prolonged exposure if conditions are smoky to the point where visibility is closer to the 5 mile range. See Table 4 *Recommended Public Health Actions*.
 - If under 5 miles, the air quality is unhealthy for young children, adults over age 65, pregnant women, and people with heart and/or lung disease, asthma or other respiratory illness. These people should minimize outdoor activity. See Table 4 *Recommended Public Health Actions*.
 - If under 3 miles, the air quality is unhealthy for everyone. Young children, adults over age 65, pregnant women, and people with heart and/or lung disease, asthma or other respiratory illness should avoid all outdoor activities. See Table 4 *Recommended Public Health Actions*.

- If under 1 mile, the air quality is very unhealthy, and in some cases may be hazardous. Everyone should avoid all outdoor activities. See Table 4 *Recommended Public Health Actions*.

Table 5

Using the 5-3-1 Visibility Index			
Distance you can see*	And you are:		Or you have:
	<ul style="list-style-type: none">• An Adult• A Teenager• An older child	<ul style="list-style-type: none">• Age 65 & over• Pregnant• A young child	<ul style="list-style-type: none">• Asthma• Respiratory Illness• Lung or Heart Disease
5 miles	Check visibility	Minimize outdoor activity	
3 miles	Minimize outdoor activity	Stay Inside	
1 mile	Stay Inside	Stay Inside	
No matter how far you can see, if you feel like you are having health effects from smoke exposure, take extra care to stay inside or get to an area with better air quality. You should also see your doctor or other health professional as needed.			
* less reliable under high humidity conditions			

6. Oregon Smoke Blog website

The Oregon Smoke Blog is a tool for providing the public with current air quality and health information on smoke impacts from wildfires. . This blog site provides timely “one-stop shopping” by including links to the various agency websites, and providing critical information on wildfire status, air quality conditions and forecasts, school and activity closures, burn bans, location of clean air shelters, and travel restrictions due to visibility. This blog would be activated by the US Forest Service or DEQ, and managed by a team of state, federal, tribal and local agencies. The link to this blog site is www.oregonsmoke.blogspot.com/.

7. Annual Pre-Wildfire Season conference call

Each year prior to the summer wildfire season, in May or June, representatives from the agencies, organizations, or offices listed in this protocol will hold a conference call in preparation for the upcoming season. The purpose of this call would be to review the information in this protocol, discuss any changes or specific preparation needs for the summer, and update the contact list of staff expected to be using this protocol if major wildfires occur. This contact list is provided in Appendix A.

8. As-Needed Wildfire conference calls and briefings

Similar to the above pre-season conference call, daily conference calls will be held during periods of major wildfire events for the purpose of briefing the parties identified in this protocol. These daily conference calls and briefings can be requested by any party, and will likely take place in the morning. They will include updates on the status of major on-going wildfires, and provide an opportunity to discuss current conditions related to air quality, local health impacts, smoke forecasts, recommended

public actions, communications, emergency actions such as evacuation, and other issues important to the group. These briefings will include a wildfire status update from public information officers (if available) associated with Incident Command, and any Air Resource Advisor assigned to the wildfire.

The lead agency for setting up these calls will be the USFS listed in this protocol. DEQ and OHA may also provide assistance in setting these calls, if needed. For major wildfires in neighboring states (Washington, Idaho, Nevada or California) that are affecting Oregon, the daily briefing will include the appropriate contacts in those states that have essential information on the wildfire(s).

In situations where a smaller group conference call is need, such as between state and local health officials to discuss specific local public health issues, or with DEQ to discuss air quality levels in areas being heavily impacted by wildfire smoke, such calls will be convened as-needed. Requests for such calls should be made to either DEQ or OHA, depending on the primary topic of concern.

9. Oregon Wildfire Communications Group

A multiagency communications group has prepared a communication plan for disseminating wildfire smoke information to the public and media. This plan identifies the roles and responsibilities of the wildfire communications group, consisting of the public affairs staff from the agencies participating in this protocol. The plan describes how the group would use the Oregon Smoke Blog, work with the 211info service, respond to requests for air quality data and health effects information, coordinate multiagency press releases and public service messaging, and schedule briefings and meetings to ensure the group is up to date on wildfire status and air quality conditions in areas being impacted by wildfire smoke. For further information on this communications plan contact Cory Grogan at Oregon Emergency Management.

10. Indoor Air Monitoring Equipment

Wildfire smoke can also affect indoor air quality, in private businesses and public buildings such as schools and offices. Research has shown that when there are heavy outdoor smoke levels, a significant amount of smoke can still infiltrate indoors, even with all of the windows and doors closed. Many commercial buildings and schools mechanically draw in the outdoor air through air filtration systems. However, standard HVAC air filters will not remove most of the ultra-fine smoke particles. More information about the use of air filters, cleaners and other ways to reduce indoor smoke levels can be found in the document cited below *Wildfire Smoke: A Guide for Public Officials (2008)*.

There are different types of indoor air monitors that can be used to indicate the potential health risk when indoors. This monitoring equipment is generally focused on PM_{2.5}, but may also detect carbon monoxide and other toxic gases. Other features include measuring temperature and relative humidity. Indoor monitoring equipment is typically less expensive than outdoor equipment, is relatively low maintenance, and can provide the same real-time measurements in micrograms per cubic meter (µg/m³), via handheld or portable monitors. These monitors can be purchased, or in some cases rented, during wildfire smoke events. Contact DEQ for more information on the different types, availability and cost of this equipment. As noted in Table 3 of the protocol, DEQ is responsible for monitoring air quality outdoors, and does not have equipment for indoor air monitoring.

11. Other references, resources, and links

Wildfire Smoke: A Guide for Public Officials (2008). The smoke exposure levels listed above in Table 4 are adapted from the 2008 guidance document *Wildfire Smoke: A Guide for Public Health Officials*. This document is currently used in many states as a reference guide for how public agencies can best protect public health during wildfire events. In addition to providing background information on the composition of smoke, potential health effects, and recommended actions, it contains specific strategies on how to reduce smoke exposure, such as indoor air filters and cleaners, use of masks and respirators, setting up clean air shelters, and examples of public service announcements for wildfire. This document is referenced here as general guidance to provide additional information, and like this protocol, is not intended to replace, interfere with, or limit any action taken by a public agency in the course of performing its official duties, nor does it represent a legally binding document.

Wildfire-related websites. In addition to the Oregon Smoke Blog described above, these web links can provide current information on wildfire activity:

1. InciWeb (Incident Information System): <http://inciweb.nwccg.gov/>
2. Northwest Coordination Center (NWCC): www.nwccweb.us/index.aspx
3. Oregon Department of Forestry: www.wildfireoregondeptofforestry.blogspot.com/
4. US Forest Service fire map: <http://activefiremaps.fs.fed.us/>
5. National Weather Service air quality and smoke maps: <http://airquality.weather.gov/sectors/pacnorthwest.php#tabs>
6. The AIRNow website: www.airnow.gov/
7. Oregon DEQ Wildfire website: www.deq.state.or.us/aq/burning/wildfires/index.htm
8. Oregon DEQ Air Quality Index map (smoke levels provided in 1-hour and 24-hour averages): www.deq.state.or.us/aqi/index.aspx

Oregon Webcams. The following are links to live webcams which can be used to view wildfire smoke conditions around the state. However, many are designed to show only traffic and road conditions, and do not provide very good image resolution for viewing smoke. Some are much better than others.

- **Oregon Department of Transportation Trip Check.** Has a custom feature that allows multiple webcams to be viewed on the same page: www.tripcheck.com/Pages/CamerasEntry.asp
- **The Weather Underground.** This weather website has a webcams directory that allows the user to zoom in on Oregon to see live images around the state, both transportation and general views: www.wunderground.com/webcams
- **US Forest Service, Air Quality, Real Time Images.** This website currently provides only two live webcams in Oregon – Mt. Hood and the eastern part of the Columbia River Gorge – but both provide high resolution images: www.fsvisimages.com/descriptions.aspx

- **US Forest Service, Air Quality, Real Time Images.** This website currently provides only two live webcams in Oregon – Mt. Hood and the eastern part of the Columbia River Gorge – but both provide high resolution images: www.fsvisimages.com/descriptions.aspx
- **Brasada Ranch, near Bend.** One of the better live webcams for central Oregon, looking to the west and Cascade Mountains. Can provide time-lapse imagery, including past dates: <http://brasada.miles360.com/webcam>

Map of High Wildfire Risk Areas in Oregon. A map of the areas in Oregon that have a greater potential for major wildfire, prepared by the Oregon Department of Forestry, and can be found at this link:
www.oregon.gov/ODF/RESOURCE_PLANNING/forestatlas/Communities_at_Risk_of_Wildfire_06032010.jpg.

For other ODF fire risk maps: www.oregon.gov/odf/Pages/fire/fire.aspx#Significant_Fire_Potential

Oregon Health Authority - health effects from wildfire smoke. The Oregon Health Authority maintains fact sheets with general information about the health effects of wildfire smoke and strategies to minimize these effects:
<http://public.health.oregon.gov/Preparedness/Prepare/Pages/PrepareForWildfire.aspx>

12. Appendices

Current Agency Contact List. Appendix A of this protocol is a contact list of representatives from the agencies and organizations identified in this protocol. Annual updating of this contact list will be necessary, and should be conducted at the annual pre-wildfire season conference call, as noted in #7.

Examples of Wildfire Smoke Public Announcements. Appendix B of this protocol provides examples of two DEQ public announcement/press releases from 2012, which can be used as a guide for future announcements.

Appendix A

Oregon Contact List

CONTACT AGENCY OR ORGANIZATION	STAFF NAME and POSITION	CONTACT PHONE/EMAIL
1. US Forest Service	Rick Graw , <i>Pacific Northwest Region, Air Quality Program Manager.</i> Willie Begay , <i>Pacific Northwest Region, Smoke Program Manager</i> Janice Peterson , <i>Pacific Northwest Region, Forestry Sciences Lab, Washington Zone Coordinator</i>	(503) 808-2918 rgraw@fs.fed.us (503) 808-2390 cell (503) 545-8173 wbegay@fs.fed.us (206) 732-7845 jlpeterson@fs.fed.us
2. Air Resource Advisor - National Coordinator	n/a (if assigned to major WF event)	(202) 205-1084 Pete.lahm@gmail.com
3. Red Cross	Paula Fasano Negele , <i>Communications Director</i> Julie Miller <i>Communications Specialist</i> Duty Officer	(503) 528-5629 paula.negele@redcross.org (503) 528-5633 julie.miller@redcross.org 1-888-680-1455 (duty officer)
4. Oregon Dept. of Environmental Quality	Brian Finneran , <i>DEQ Air Quality, Portland Headquarters</i> Larry Calkins , <i>DEQ Eastern Region, Pendleton Office</i> Byron Peterson , <i>DEQ Western Region, Medford Office</i> Greg Sveland , <i>DEQ Public Affairs, Bend Office</i>	(503) 229-6278 finneran.brian@deq.state.or.us (541) 278-4612 calkins.larry@deq.state.or.us (541) 776-6052 peterson.byron@deq.state.or.us (541) 633-2008 Sveland.Greg@deq.state.or.us
5. Oregon Health Authority	Kathleen Vidoloff , <i>Lead Analysis, Preparedness Surveillance and Epidemiology Team</i> Susan Wickstrom , <i>Public Information Officer</i> David Farrer , <i>Public Health Toxicologist, Environmental Public Health</i> Dan Cain , <i>Industrial Hygienist, Environmental Public Health</i> Richard Leman , <i>Chief Medical Officer, Health Security Preparedness and Response</i> Theresa Watts , <i>Public Health Nurse, Preparedness Surveillance and Epidemiology Team</i> Allan Visnick , <i>Planner, HSPR</i>	(971) 673-1012 kathleen.g.vidoloff@state.or.us (971) 673-0892 Susan.d.Wickstrom@state.or.us (971) 673-0971 david.g.farrer@state.or.us (971)-674-0197 daniel.t.cain@state.or.us (971) 673-1089 richard.f.leman@state.or.us 971-673-1062 theresa.m.watts@state.or.us (503) 572-7658 allan.d.visnick@state.or.us

CONTACT AGENCY OR ORGANIZATION	STAFF NAME and POSITION	CONTACT PHONE/EMAIL
6. Oregon Military Department, Office of Emergency Management	Cory E. Grogan , <i>Public Information Officer</i> Kim Lippert , <i>Public Information Officer</i> Dennis Sigrist , <i>State Hazard Mitigation Officer</i>	(503) 383-6608 Cory.grogan@state.or.us (503) 378-2911 ext. 22283 Kim.lippert@state.or.us (503) 378-2911 x22247 dennis.sigrist@oem.state.or.us
	Stephen Bomar , <i>Public Affairs Officer</i>	(503) 584-3885 stephen.s.bomar.mil@mail.mil
7. Oregon OSHA	Peg Munsell , <i>Standards and Appeals Manager</i> Penny Wolf-McCormick , <i>Health Enforcement Manager</i> Melanie Mesaros , <i>Public Information Officer</i>	(503) 378-3272 peggy.a.munsell@state.or.us (503) 229-5910 penny.l.wolf- mccormick@state.or.us (503) 947-7428 melanie.l.mesaros@state.or.us
8. Oregon Dept. of Forestry	Nick Yonker , <i>Meteorology Manager</i> Rod Nichols , <i>Public Affairs</i>	(503) 945-7451 nick.j.yonker@state.or.us (503) 945-7425 rod.l.nichols@state.or.us
9. Governor's Office Regional Solutions Centers	Annette Liebe , <i>Central Oregon Coordinator - Crook, Deschutes, Hood River, Jefferson, and Klamath counties</i> Scott Fairley , <i>Eastern Oregon Coordinator - Baker, Gilliam, Grant, Harney, Malheur, Morrow, Umatilla, Union, Wheeler, and Wallowa counties</i> Jeff Griffin , <i>Southern Oregon Coordinator - Coos, Curry, Douglas, Jackson, and Josephine counties</i> Jamie Damon , <i>South Valley Coordinator - Benton, Lane, Lincoln, and Linn counties</i>	(541) 610-7215 annette.liebe@state.or.us (541) 429-2120 scott.g.fairley@state.or.us (541) 601-0408 jeff.griffin@state.or.us (541) 346-8626 jamie.damon@state.or.us
10. Lane Regional Air Protection Agency	Sally Markos , <i>Public Affairs Manager</i>	(541) 736-1056 x217 smarkos@lrpa.org
11. County Health Departments	http://public.health.oregon.gov/ProviderPartnerResources/LocalHealthDepartmentResources/Pages/lhd.aspx	

12. Tribal Government	<p>Confederated Tribes of the Umatilla Indian Reservation, Jack Butler, <i>Air Quality Specialist</i>, (541) 429-7422 jackbutler@ctuir.com</p> <p>Confederated Tribes of Warm Springs, Tim Outman, <i>Air Quality Specialist</i>, (541) 553-2016 tim.outman@wstribes.org</p> <p>Confederated Tribes of Coos, Lower Umpqua, & Siuslaw Indians, Margret Corvi, <i>Environmental Monitoring Specialist</i>, (541) 888-1304 MCorvi@ctclusi.org</p> <p>For other tribal contacts¹: https://www.oregonlegislature.gov/cis/Documents/Natural_Resources_Tribal_Cluster_ContactsMarch2014.pdf</p>	
13. 211info www.211info.org/	Troy Hammond , <i>Chief Operating Officer</i>	(503) 416-2620 cell (503) 504-9867 troy@211info.org
14. EPA Region 10	Gary Olson , <i>FARR implementation</i>	(206) 553-0977 olson.gary@epa.gov

¹ Oregon 2013 Tribal Key Contact Directory link. This may not be the actual contact for wildfire smoke and air quality issues.

Out-of-State Contact List

CONTACT AGENCY OR ORGANIZATION	STAFF NAME and POSITION	CONTACT PHONE/EMAIL
15. Idaho Department of Environmental Quality	Mary Anderson , <i>Smoke Management Program Coordinator, Air Quality Division, Boise ID</i>	(208) 373-0202 mary.anderson@deq.idaho.gov
16. Washington Department of Ecology	Sean Hopkins , <i>Smoke Management AQ Specialist, Central Regional Office, Yakima WA</i>	(509) 575-2490 seho461@ecy.wa.gov
17. Nevada Division of Environmental Protection	Sig Jaunara , <i>Supervisor Environ. Scientist IV, Bureau of Air Quality Planning, Carson City, NV</i>	(775) 687-9392 sjaunara@ndep.nv.gov
18. California Air Resources Board	Greg Vlasek , <i>Monitoring and Laboratory Division, Office of Emergency Response</i>	(916) 323-4294 cell (916) 838-0872 gvlasek@arb.ca.gov
19. US Forest Service, California	Trent Proctor , <i>Regional Air Program Manager, Southwest Region, Porterville CA</i>	(559) 784-1500, ext. 1114 tproctor@fs.fed.us

Appendix B

Example 1 of Wildfire Smoke Public Announcement

News Release

For release: *date*

Contacts: *names, phone numbers*

***[Agency name] Urges Oregonians to Protect Themselves from Wildfire Smoke
It's wildfire season in Oregon and smoke could be on the way. [Agency name] advises people
to take precautions to protect themselves from unhealthy smoke levels.***

Wildfire season is underway with *[xx wildfires]* currently burning in the state. Under certain weather conditions smoke from these fires can drift into communities and quickly cause unhealthy air quality. Should smoke events occur, *[agency name]* and health officials urge local residents to take the following precautions to avoid breathing problems or other symptoms from smoke:

- Be aware of smoke concentrations in your area and avoid the places with highest concentrations.
- Avoid smoke either by leaving the area or protecting yourself by staying indoors, closing all windows and doors and using a filter in your heating/cooling system that removes very fine particulate matter
- Avoid strenuous outdoor activity in smoky conditions.
- People suffering from asthma or other respiratory problems should follow their breathing management plans or contact their healthcare providers.

Remember, local smoke levels can rise and fall rapidly, depending on weather factors including wind direction. People can conduct a visual assessment of smoke levels to quickly get a sense of air quality levels and take precautions. If people have additional concerns, they should contact the nearest regional or local public health agency for the latest in health conditions from smoke.

For more information about local conditions:

- Visit the Oregon Smoke Blog for more information regarding active fires and air quality, along with tools to help people assess smoke levels in their area.
- Tune to local radio and TV stations and the Weather Channel in affected areas that may include the very latest fire information in news programming and weather reports.
- Obtain a dedicated NOAA Weather Radio receiver, which will alert you 24 hours a day to hazards in your area.

Appendix B

Example 2 of Wildfire Smoke Public Announcement

News Release

For release: *date*

Contacts: *names, phone numbers*

Smoke From *[wildfire name]* Creates Hazardous Air Quality

Calm winds and a temperature inversion caused smoke concentrations to reach hazardous levels between 4 a.m. and 8 a.m. today. Conditions improved as daytime temperatures increased, but very smoky conditions could return early Wednesday morning.

The *[wildfire]*, *xx* miles from *[location/city]* sent dense smoke into the town in the early morning hours today. Calm conditions and a temperature inversion caused smoke from the fire to settle in at ground level between 3 a.m. and 9 a.m. Smoke concentrations at the air quality monitor in *[city]* reached hazardous levels during this time.

[Agency name] urges everyone to avoid outdoor exertion during such conditions. People with respiratory or heart disease, the elderly and children should remain indoors.

The National Weather Service predicts that calm conditions, a high pressure system and nighttime temperature inversions could cause very smoky mornings through Saturday. Conditions are expected to improve as daytime temperatures rise and the smoke lifts away from ground level.

However, under certain weather conditions wildfire smoke can drift into communities and quickly cause unhealthy air quality. Should additional smoke events occur, *[agency name]* and health officials urge local residents to take the following precautions to avoid breathing problems or other symptoms from smoke:

- Be aware of smoke concentrations in your area.
- Avoid smoke by staying indoors, closing all windows and doors and using a filter in a heating/cooling system that removes very fine particulate matter. If possible, avoid smoky areas.
- Avoid strenuous outdoor activity including sports practice, work and recreation.
- People with concerns about health issues, including those suffering from asthma or other respiratory problems should follow their breathing management plans or contact their healthcare providers.

Remember, local smoke levels can rise and fall rapidly, depending on weather factors including wind direction. People can conduct a visual assessment of smoke levels to quickly get a sense of air quality levels and take precautions. If people have additional concerns, they should contact the nearest regional or local public health agency for the latest in health conditions from smoke.

For more information about local conditions:

- Visit the Oregon Smoke Blog for more information regarding active fires and air quality, along with tools to help people assess smoke levels in their area.
- Tune to local radio and TV stations and the Weather Channel in affected areas that may include the very latest fire information in news programming and weather reports.
- Obtain a dedicated NOAA Weather Radio receiver, which will alert you 24 hours a day to hazards in your area.